PROFESSIONAL MASTER'S PROGRAMME (2ND LEVEL) IN SCIENCE AND MANAGEMENT OF CLIMATE CHANGE
THIRD EDITION
A.A. 2020-2021

Presentation

Climate change is one of the main challenges posing major risks to the society at large, as well as to business and industries. According to the World Economic Forum, the failure to implement effective mitigation and adaptation policies is one of the top-five economic risks for the business world.

The Professional Master in Science and Management of Climate Change is a 1-year programme aimed at preparing professional leaders capable of managing the complex and multi-faceted risks posed by climate change, as well as the opportunities that might arise.

Objectives

- Provide high-level academic training about the scientific and socio-economic aspects of climate change in a Master's programme, integrated with the PhD in Science and Management of Climate Change.

- Prepare experts with a broad and thorough scientific background in environmental economics, climate science, valuation techniques, and with specific modelling skills.

- Prepare leaders who can understand, synthesize, and communicate the biophysical and socio-economic nature of climate change, evaluate the socio-economic implications of climate change risks, and design innovative policy solutions and risk management strategies.

- Prepare experts familiar with a suite of methodological, analytical, statistical and modelling tools that make it possible to i) explain the physical and economic nature of climate change and their uncertainty, ii) assess the socio-economic impacts of climate change, their costs and benefits, iii) estimate and manage climate change risk, iv) analyze, evaluate, and design innovative climate policy solutions, v) conceive transformational pathways in the context of sustainable development.

Third edition 2020-2021 – A new study plan

First term: Foundations, articulated in six courses (Mathematics, Statistics, Econometrics and Machine learning, Climate dynamics, Environmental and climate change economics, Climate of the past).

Second term: Choice between two streams articulated in five courses each (30 CFUs).

1- **Climate Economics and Finance** (Decision theory and multi-criteria analysis, CGE and integrated assessment modelling, Applied environmental economics and policy evaluation, Domestic and international climate policies, Climate finance)
2- **Climate Modelling and Impact Assessments** (Chemodynamics, Climate change and environmental quality, Ice Sheets and Glaciers in the Climate System, Risk Assessment and Decision Support System for Environmental Impacts of Climate Change, Adaptive Management of Natural Resources and Agricultural Systems, Climate Damage Modelling and Assessment)

Students will take 11 courses (66 CFU), for an overall amount of coursework of 320 hours. Additional labs, guest lectures from international experts, seminars, hands-on sessions, group activities, presentation of group/individual projects will be provided/organized.

Foundations

Introduction to R (no CFU)

Hands-on sessions with the R statistical software. Lectures will focus on imparting data handling and analysis skills utilizing various commonly used scientific data formats (e.g. netCDF, ascii etc). Students will also be introduced to geo-spatial mapping routines in R to facilitate rapid spatiotemporal aggregation and mapping of environmental and socio-economic data.

Mathematical Modelling and Programming (Pasut)

Understanding of dynamic systems and preliminary concepts such as linear algebra, eigenvalues, complex numbers. Introduction to mathematical instruments for dynamic systems and applications to environmental problems.
Lectures will focus on theory as well as on applications through hands-on sessions.

Statistics (Prosdocimi)

The course introduces the statistical methods useful to quantify changes in climate variables and the impacts of climate change on human activities. Students will learn how to specify, fit and interpret a variety of statistical models, and how to use them to answer scientific questions about the climate. The material is introduced using numerous case studies. Hands-on sessions with the R statistical software will be an integral part of the course.

Econometrics (Mammi)

Introduction to the theoretical and modelling elements of econometrics. Application of econometric methods (e.g. panel and cross-section data) for assessing climate impacts, with particular emphasis on pros and cons of different approaches will be central to the course. Lectures will also focus on hands-on econometric exercises in R.

Machine learning (Torsello)

Introduction to the principles and elements of machine learning. Application of commonly used neural networks and other machine learning approaches with focus on climate science will be a central theme of the course. Lectures will include hands-on machine learning algorithms using Python programming language. Students will get an overview and experience in data science, a hot topic having wide-ranging applications in environmental studies.

Introduction to Climate Dynamics (Zanchettin)

Introduction to climatology. Basic understanding of how Earth's climate operates and how it is investigated by contemporary and pioneering climate research, with focus on the physical components of climate. Students will become familiar with the main modern tools used for characterization, understanding and prediction of climate and learn fundamentals of anthropogenic climate change and natural climate variability. Lectures will be frontal.

Environmental and Climate Change Economics (De Cian)

Market failures and environmental externalities. The role of climate policy in the broader context of sustainable development and planetary boundaries. Climate-economy tools to simulate and evaluate climate policy instruments. Lectures will focus on theory and applications through hands-on sessions, group discussion, and students' presentations. Students will learn to compare costs and benefits of climate change, analyze, evaluate, and design climate policy solutions, conceive transformational pathways in the context of sustainable development.

Climate of the past (Barbante)

Introduction to paleo-climate, time scales of climate change, and climate in human history. Methods for detecting climate change, including proxies, ice cores, instrumental records, and time series analysis. Lectures will focus on the physical and chemical processes in climate, including primordial atmosphere, ozone chemistry, carbon and oxygen cycles, and heat and water budgets. Students will learn about the internal feedback mechanisms in earth's climate system, including ice, aerosols, water vapor, clouds, and ocean circulation.

Stream 1: Climate Economics and Finance Stream

Decision Theory and Multi-criteria Analysis (Giove)

Methodological basis of Decision Theory under uncertainty, Utility Theory, Decision Tree, Group Decision, Weighted Averaging, Ordered Weighted Averaging. Methods for optimization problems, in particular Linear Programming approach and some extensions.
Lectures will focus on methods as well as hands-on exercises in R. Students will learn how to understand, specify, describe some problems in this field, and to implement a resolution strategy.

CGE and integrated assessment modelling of climate change impacts and policies

Overview of macroeconomic approaches used to study the socio-economic impacts of climate change and the adaptation responses. Four topics related to different modelling aspects: discounting, impacts assessment, mitigation and adaptation policy assessments. Focus on Computable General Equilibrium (CGE) models. Lectures will focus on theory as well as applications with hands-on sessions. Students will learn the theoretical foundations of those models and learn how to apply them for the analysis of the socio-economic impacts of climate change.

Applied Environmental Economics and Policy Evaluation (Vona)

The objective of the course is to introduce students to the use of econometric methods to evaluate historical environmental and climate policies, with an empirical focus on their impacts on innovation and employment.

Domestic and International Climate Policies (Carraro)

Recent history of international negotiations on climate change to identify the main factors that prevent countries to achieve a widespread and effective agreement. Lectures will focus on the economic theory of climate negotiations using a quantitative approach based on game theory. The course will also review the main climate policy instruments with particular emphasis on the design of emission permits schemes both nationally and internationally.

Climate finance (Battiston)

Climate risk differs from other sources of risk traditionally analysed in finance. The course focuses on the new scientific approaches required to describe and manage climate-related risk, a topic of increasing interest for practitioners of both public and private financial institutions. Student will learn: i) the main theoretical notions of climate financial risk (in class) and ii) practical know-how for the computation of metrics of climate financial risk on empirical data (hand-on sessions).

Stream 2: Climate Modelling and Impact Assessments

Chemodynamics, climate change and environmental quality (Marcomini)

Basic concepts of environmental chemistry and thermodynamics. Climate system under a chemical and thermodynamic perspective. Impacts of climate change on environmental chemical pollution. Environmental risk assessment by exposure to chemicals. Lectures will focus on the behavior of environmental pollutants having different lifespans, with emphasis of the feedback cycle under climate change. Students will learn of the overall framework of contaminants' management, and to estimate and manage climate change risk.

Ice Sheets and Glaciers in the Climate System (Lucchi/Colleoni)

Basis of the processes related to past ice sheet dynamics through the use of ice-sheet related or ocean-related proxies in geological archive or by using geophysical methods to depict the past dynamics, and through the study of the polar high latitude atmospheric and oceanic dynamical processes affecting and interacting with the ice sheets and glaciers based on numerical modeling and or the direct comparison/integration of past and current observation in numerical models. Lectures will be organized in two blocs. Students will learn

Risk Assessment and Decision Support System for Environmental Impacts of Climate Change (Critto)

Tools, methods and skills required for assessing environmental hazards, vulnerability and risks posed by climate change in the context of global environmental changes. Decision Support System for climate change risk assessment and management. Lectures will focus on theory as well as on applications through hands-on sessions, students' presentations, and group discussion. Students will learn to define and implement environmental risk analysis, impacts and vulnerability assessment, and use related specific decision support systems.

Adaptive Management of Natural Resources and Agricultural Systems (Giupponi)

Introduction to the principles of natural resources management. Lectures will focus on the interactions between natural and human elements of socio-ecosystems and agro-ecosystems in particular. Sustainability and sustainable development will be central themes of the course. System dynamics will be the most widely used approach. Spatial and temporal dynamics are explored with concrete examples and case studies. Students will be involved in individual and group case-studies and learn methods and tools for problem-solving approaches.

Climate Damage Modelling and Assessment (Mysiak)

Theoretical and practical understanding of the methods and tools to assess climate change risk and the economic benefits of climate adaptation. Analysis of climate policies and management of risks deriving from climate change and variability.

Lecture will focus on methods as well as applications in R and QGIS. Students will learn to estimate and manage climate change risk utilizing current geospatial modelling tools and practices.

Duration and summary of didactic activities and university credits (CFU)

The Master's lasts for one year with 320 hours of didactic activities (66 CFU) and additional 50 hours of practical, hands-on sessions. A 250 hour internship (10 CFU) forms an integral part of the course and represents an excellent opportunity to enter the workplace. The internship is mandatory. For students already working professionally in the sector, the same activities, accompanied by the drafting of a project work, will be recognized as valid for the completion of the internship.

Including individual study and preparation of a final thesis (8 CFU), the course requires an overall commitment of 620 hours, for a total of 84 CFU**.**

Qualification issued

Students attending the didactic activities, completing the internship and passing the intermediate verifications and final examination will be awarded the Professional Master's Diploma (2nd level) in Science and Management of Climate Change.

Course period

September 2020 - September 2021

Teaching method

Frontal lectures, hands-on-sessions, discussion groups, labs, seminars, guest lectures from international experts.

Language

English

Attendance

Attendance will be monitored by signing a register. Regular attendance in the classroom is obligatory to passing the individual modules. Absences must not in any case exceed 20% of teaching hours for each individual module. Credits are assigned with completion of the individual modules and internship/project work activities and passing of the final examination. Students employed in a professional activity coherent with the Master's course may ask for this to be recognized in calculating the credits allocated to internship and work placement activities.

Course location

Ca' Foscari Challenge School, via della Libertà 12, 30175 Venezia (Parco Vega) /Economic Campus San Giobbe/Scientific Campus Via Torino, 30175 Venezia Marghera

Admission requirements

SECOND LEVEL
To enroll in the Master's, candidates must be in possession of at least a second cycle, specialization or pre-reform (ante Italian Ministerial Decree no. 509/99) degree in a scientific or economic subject. At the

discretion of the Master's teaching board, candidates with other degrees, or foreign equivalent foreign university qualifications, may be considered on the basis of their previous education and training and in respect of current legislation. English language to proficiency level of at least level B2.

Admission application

Candidates must fill in the online admission application, the details of which are defined under article 3 of the University's Call for Applications. Only applications accompanied by all the required documentation will be considered. The Call for Applications and relative attachments can be downloaded from the Master's website.

Selection procedure

A specific Board will assess candidates based on their CVs, qualifications submitted and a personal interview (the date, time and place will be communicated by email with sufficient advance notice; on motivated request, the interview may take place by video-conference). The oral admission test, in English, will aim to ascertain the candidate's motivations, but also to verify the competencies already acquired in subjects necessary for quantitative analysis and mathematical and statistical modelling, as well as the candidate's ability to express themselves in English. The main factors considered for the purposes of selection will be: qualifications, motivation, relational skills, relevant former educational and professional experiences and a willingness to respect then necessary attendance requirements.

Graduate eligibility

Students about to graduate may also be admitted to the course, provided they qualify within one month from the start of the course. In this case, enrolment to the Master's programme may be finalized only after the valid qualification for admission has been awarded. Candidates without a degree may enroll as auditors and will be awarded a certificate of attendance.

Available places

Maximum number of available places: **5**

Course fees: € 6.000

1st instalment by 28/08/2020: € 3.016 (including € 16 stamp duty)*
2nd instalment by 10/01/2021: € 3.000
* Stamp duty is not refundable. Fees should be paid through PagoPA

Study support

Loans are available from the University's partner banks (for more information:
http://www.unive.it/pag/8560/).

Enrolment

ADMISSION APPLICATION SUBMISSION (online procedure, Call for Applications, art. 3)
by August 7 2020
ORAL INTERVIEW
August 17 2020
SELECTION AND RESULT ANNOUNCEMENT
by August 19 2020
ENROLMENT COMPLETION   (online procedure, Call for Applications, art. 6)
by August 28 2020
Beginning of courses: September 2020. See https://www.unive.it/data/7886/ for updates

Course coordinator and deputy coordinator

Prof.ssa Enrica De Cian, Malcolm Mistry

Website

www.unive.it/climate

For information

On **enrolment procedures and internships**, please contact:

The Post-lauream office, **e-mail:** postlauream@unive.it, **Tel**: (+39) 041 234 7575

The Department of Environmental Sciences Informatics and Statistics, Scientific Campus

Via Torino n. 155, 30170 Mestre (VE), Italy, **e-mail:** segreteria.dais@unive.it, fedefaso@unive.it, **Tel**: (+39) 041 234 8565

On **didactic activities** and the **calendar** of lessons, please contact:

e-mail: phd-climate-change@unive.it

Tel: +39 041 234 7743